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(11) **EP 1 044 817 A2**

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.10.2000 Bulletin 2000/42

(51) Int. Cl.⁷: **B41J 11/00**

(21) Application number: **00108345.0**

(22) Date of filing: **14.04.2000**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **16.04.1999 JP 10978999**

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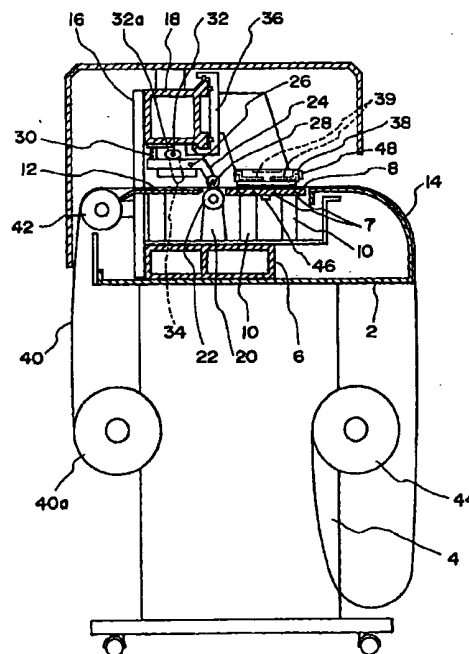
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(54) **Ink jet printer and method for operating the same**

(57) An ink jet printer and a method for operating the same are proposed. In order to improve the printing quality, the paper and the ink are heated to substantially the same temperature.

FIG. 1



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Description

[0001] The present invention relates generally to computer hard copy printers, and more particularly to ink jet printers in which ink droplets from a recording head of the ink jet type are discharged to a paper on a platen to perform a drafting or printing on the paper. In particular, the present invention relates to an ink jet printer according to the preamble of claim 1 and to a method according to the preamble of claim 4.

[0002] JP 4-263949 A or JP 2576470 B discloses an inkjet printer in which a platen heater is mounted on a platen, and the paper on the platen is heated by heating the platen. The droplets discharged from the recording head are caused to adhere to the paper.

[0003] Depending on slight differences of the quality of material of the drafting medium (paper, film and the like) the printing quality may vary. Particularly, in case where the drafting is performed by an ink of the solvent type, the ink goes into the drafting medium and slightly dissolves the drafting medium, and the ink tends to run depending on the quality of the drafting medium. This phenomenon seems to form a problem. Although this problem is greatly influenced by the case where ink of the solvent type is used, such an influence is recognized also when ink of an other kind is used.

[0004] The diameter or shape of the dots of the ink is not uniform according to the manner of blot of the ink, and the finish precision of a completed print (drawings, pictures and the like) is poor, and a fine finish is hard to obtain which are problems.

[0005] Object of the present invention is to solve or minimize the foregoing points and problems and to provide an ink jet printer and a method for operating an ink jet printer, with improved printing quality.

[0006] The above object is achieved by an ink jet printer according to claim 1 or a method according to claim 4. Preferred embodiments are subject of the sub-claims.

[0007] It has been discovered that the shape of the dots of ink fails to become a uniform circular shape, or its diameter fails to be uniform due to the foregoing problem and due to the finding that when the ink is injected from a nozzle of the recording head and the ink reaches the drafting medium, a sharp temperature change occurs in the ink and a disarray such as diffusion, blot and the like tends to occur once there is a difference in the temperature of the ink and the temperature of the drafting medium. As a result, the finish accuracy deteriorates.

[0008] The present invention proposes to heat both the drafting medium and the ink (recording head) to equalize both the medium and the ink to an almost same temperature. In particular, this is used in ink jet printers in which a paper support provided on a machine body is heated, and ink droplets from a recording head of an inkjet type are discharged onto the heated paper and the drafting or printing is performed

on the paper in a condition where the paper on the paper support is heated and a drafting quality of such ink jet printers is thus improved.

[0009] The paper sandwiched between a feed roller and a pressure roller is fed onto a platen by the rotation of the feed roller, and it is heated at a desired temperature which is preferably set between 35°C and 50°C by a heater provided on the platen. The ink droplets heated at a temperature same with the heated paper or almost same with the temperature are discharged and the printing is carried out on the paper.

[0010] Further aspects, features and advantages of the present invention will be explained with reference to the enclosed drawing of a preferred embodiment. It shows:

Fig. 1 an explanatory side view of an ink jet printer; and

Fig. 2 a block explanatory view showing a function of the ink jet printer.

[0011] A preferred embodiment of the present invention will be described in detail in the following by referring to attached drawing.

[0012] In Fig. 1, reference numeral 2 denotes a machine body of the ink jet printer. The machine body 2 is supported on a leg body 4. On the machine body 2, a pedestal 6 extending in a direction perpendicular to the surface of the paper is fixed, and a platen 8 provided with a heater 7 is supported on the pedestal 6 by means of bases 10. Paper guides 12, 14 are disposed back and forth of the platen 8.

[0013] Reference numeral 16 denotes a pair of struts (the other is omitted) fixed to the vicinity of both ends of the pedestal 6, and a Y rail 18 is mounted on an upper portion the struts 16. On the pedestal 6, a support base 20 is fixed, and a feed roller 22 is journaled on the support base 20. The feed roller 22 is connected to an X axis drive device to be controlled by a controller (illustration is omitted). A plurality of roller holders 24 are journaled at 26 on the Y rail 18. At the tip of each of the roller holders 24, a pressure roller 28 is rotatably journaled in opposition to the feed roller 22.

[0014] The rear ends of the roller holders 24 are biased in a clock direction in FIG. 1 with the axis 26 being a fulcrum by means of a tensile force of tensile springs 30. A cam shaft 32 fixed with a cam 32a is rotatably journaled on an upper surface side of the roller holders 24, and a lever 34 is fixed to one end of the cam shaft 32. When the lever 34 is swivelled by manual operation and the like, the cam shaft 32 turns, and the roller holders 24 swivel in anti-clock direction in FIG. 1 with the axis 26 as the center by the pressure of the cam 32a, and the pressure rollers 28 are separated from the feed roller 22 by a predetermined distance.

[0015] When the lever 34 returns to an original position, each pressure roller 28 contacts the feed roller 22

resiliently by the tensile resilient force of each spring 30. A Y cursor or carriage 36 is shiftably mounted on the Y rail 18 through a roller. An inkjet type recording head 38 is mounted on the Y cursor or carriage 36, and the platen 8 is in opposition to the recording head 38.

[0016] A heater 39 is built in the recording head 38. Temperature sensors 46, 48 are mounted on the platen 8 and the recording head 38, and temperature signals of the platen 8 and the recording head 38 are supplied to the controller of the ink jet printer from the sensors 46, 48. The heaters 7, 39 are connected to the controller by means of drive units 50, 52 (Fig. 2).

[0017] The platen 8 and the paper guides 12, 14 constitute a paper support, and the heater 7 may be disposed at a printing unit of the paper support and at a proper location in the upper stream side relative to the printing unit. Paper 40 drawn out from a roll 40a of paper supported on the leg body 4 is arranged to be taken upon a take-up roller 44 supported on the leg body 4 through a guide roller 42, paper guide 12, and between feed roller 22 and pressure rollers 28 and platen 8 and paper guide 14.

[0018] In order to set the paper 40 on the platen 8, the pressure roller 28 is lifted from the feed roller 22, and the paper 40 is inserted between the rollers 22 and 28, and thereafter, the pressure roller 28 is lowered and the paper 40 is sandwiched by the pressure roller 28 and the feed roller 22.

[0019] When a power source and/or the ink jet printer is turned on, the heaters 7, 39 are energized, whereby the platen 8 and the recording head 38 are heated. The temperature of the platen 8 and the recording head 38 is controlled on the basis of a temperature control program (software) 56 stored in a ROM 54 of the controller so that the paper 40 on the platen 8 and the ink discharged from a nozzle of the recording head 38 are heated at temperatures between 35°C and 50°C which are mutually equal or almost equal temperatures.

[0020] It has been confirmed as a result of experiments that if this temperature is below 35°C, the drafting quality is not improved, and any effect is extremely small. In order to elevate the temperature of the drafting medium, it is the most simple adoptable method to raise the temperature of the platen 8 on which the drafting medium is mounted, but when this method is employed, the drafting medium whose temperature is lower than that of the heated platen 8 shifts onto the platen 8 which requires the elevation of the temperature of the platen 8 to a higher level of the desired temperature of the drafting medium.

[0021] However, since the platen 8 is located at a position where hands of an operator generally tend to touch, it is dangerous to raise the temperature without due consideration, and generally about 55°C is a limit. Assuming that the upper limit of the temperature of the platen 8 is 55°C, the temperature of the drafting medium that shifts over the platen 8 becomes about 50°C when the foregoing temperature drop is taken into considera-

tion, and this temperature becomes an upper limit. In case that the kind of the used ink and the kind of the used drafting medium are constant, the set temperatures for the recording head 38 and the platen 8 are constant, and temperature set data are recorded previously in the temperature control program 56.

[0022] In case that the kind of the used ink and the kind of the used drafting medium vary, the set temperatures of the recording head 38 and the platen 8 are variable, and the set temperatures may be input with key from an operation panel 58. Furthermore, in this case, the set temperatures from a host computer 60 is input in a RAM 62 of the controller. When the ink jet printer shifts to a plotting or printing operation, the feed roller 22 makes an intermittent rotation in clock direction in FIG. 1 by a X drive unit 63, and the paper 40 shifts in right direction over the platen 8.

[0023] On the other hand, the Y cursor or carriage 36 is reciprocally driven in a direction perpendicular to the surface of the paper in FIG. 1 along the Y rail 18 by a Y drive unit 64. More-over, vector data to be transmitted from the host computer 60 is delivered to the RAM 62 through an interface (I/F) having FIFO buffering function.

[0024] A CPU 66 of the ink jet printer applies pre-processing (data analysis) such as division process, sort process with a band width and block width which are preset against the vector data stored in the RAM 62 on the basis of a program stored in the ROM 54, and arranges the vector data contained in each block of each band to a mode of an intermediate code (for example, vector data). An image processor 68 applies a DDA (digital different analysis) process sequentially to the image data of the intermediate code mode stored in the RAM 62, and develops the raster data to bit map memory 70.

[0025] The raster data developed in the bit map memory 70 are converted to CMYK data (black K, cyan C, magenta M, yellow Y or data for printing according to Euro scale) from RGB color data (red, green blue). Next, the CPU 66 sequentially sends the raster data converted to the CMYK data to a head drive unit 70. The ink is supplied to the recording head 38 by means of an ink supply drive unit 72, and the recording head 38 discharges ink droplets by the control of the head drive unit 70 to perform a drafting or printing on the paper 40.

[0026] The present invention is constructed as described in the foregoing whereby the drafting quality can be improved.

Claims

1. Ink jet printer comprising a machine body (2), a recording head (38) of the ink jet type, and a paper support, wherein paper (40) on the paper support can be heated and, thereafter, ink droplets can be discharged from the recording head (38) to the heated paper (40) for drafting or printing,

characterized in

that the recording head (38) and/or the ink can be heated, so that the temperature of the ink discharged from the recording head (38) can be set at least substantially at the temperature of the heated paper (40). 5

2. Ink jet printer according to claim 1, characterized in that the temperature of the heated paper is set at an optional value between 35°C and 50°C. 10
3. Ink jet printer according to claim 1 or 2, characterized in that a heater (39) is located in or integrated into the recording head (38). 15
4. Method for operating an ink jet printer, wherein ink is discharged on heated paper (40),
characterized in
that the ink is heated before discharge, preferably to a temperature substantially equal to the temperature of the heated paper (40). 20
5. Method according to claim 4, characterized in that the heating temperatures are about 35°C to 50°C. 25
6. Method according to claim 4 or 5, characterized in that the ink is heated only just before discharge and/or only in a recording head (38). 30

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FIG. 1

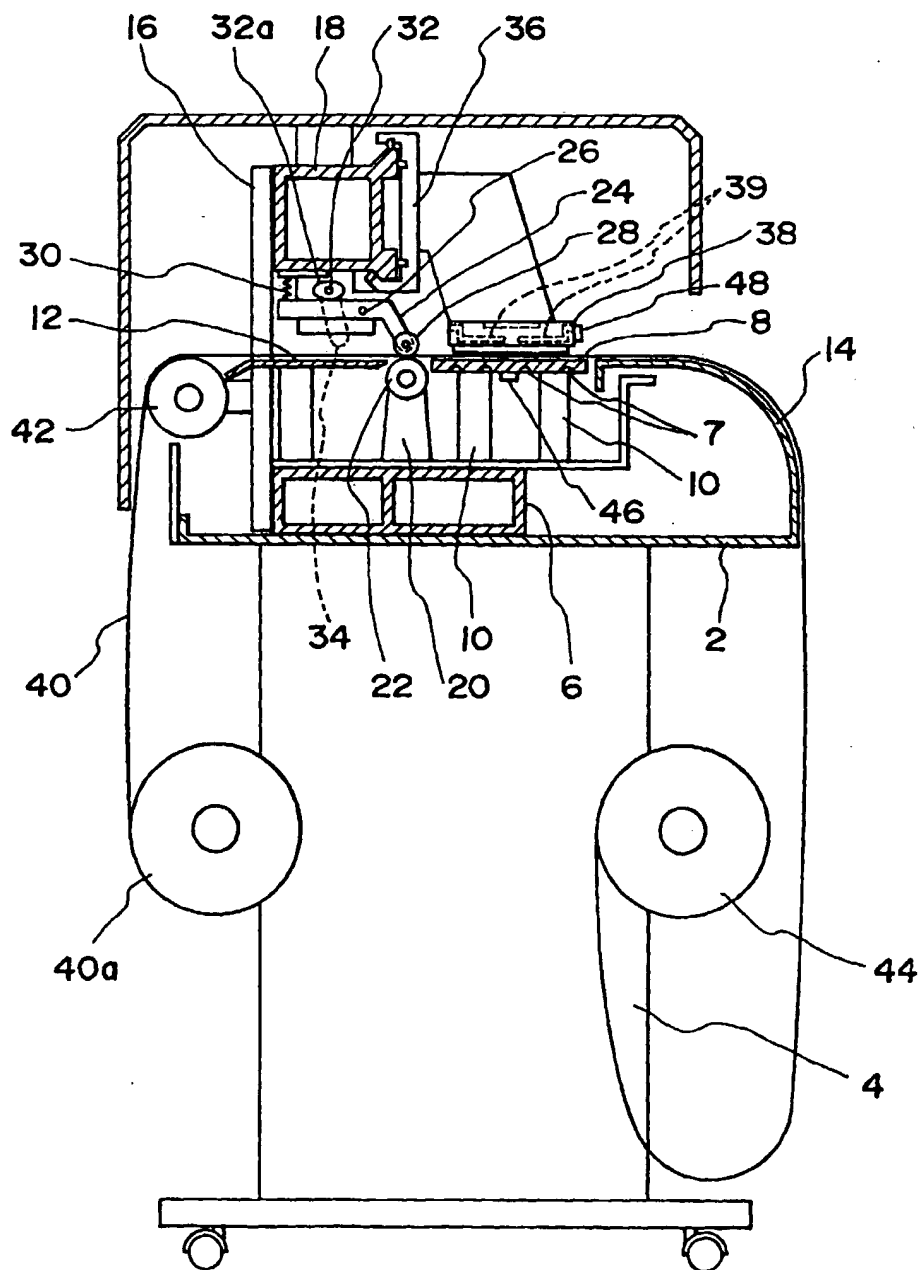
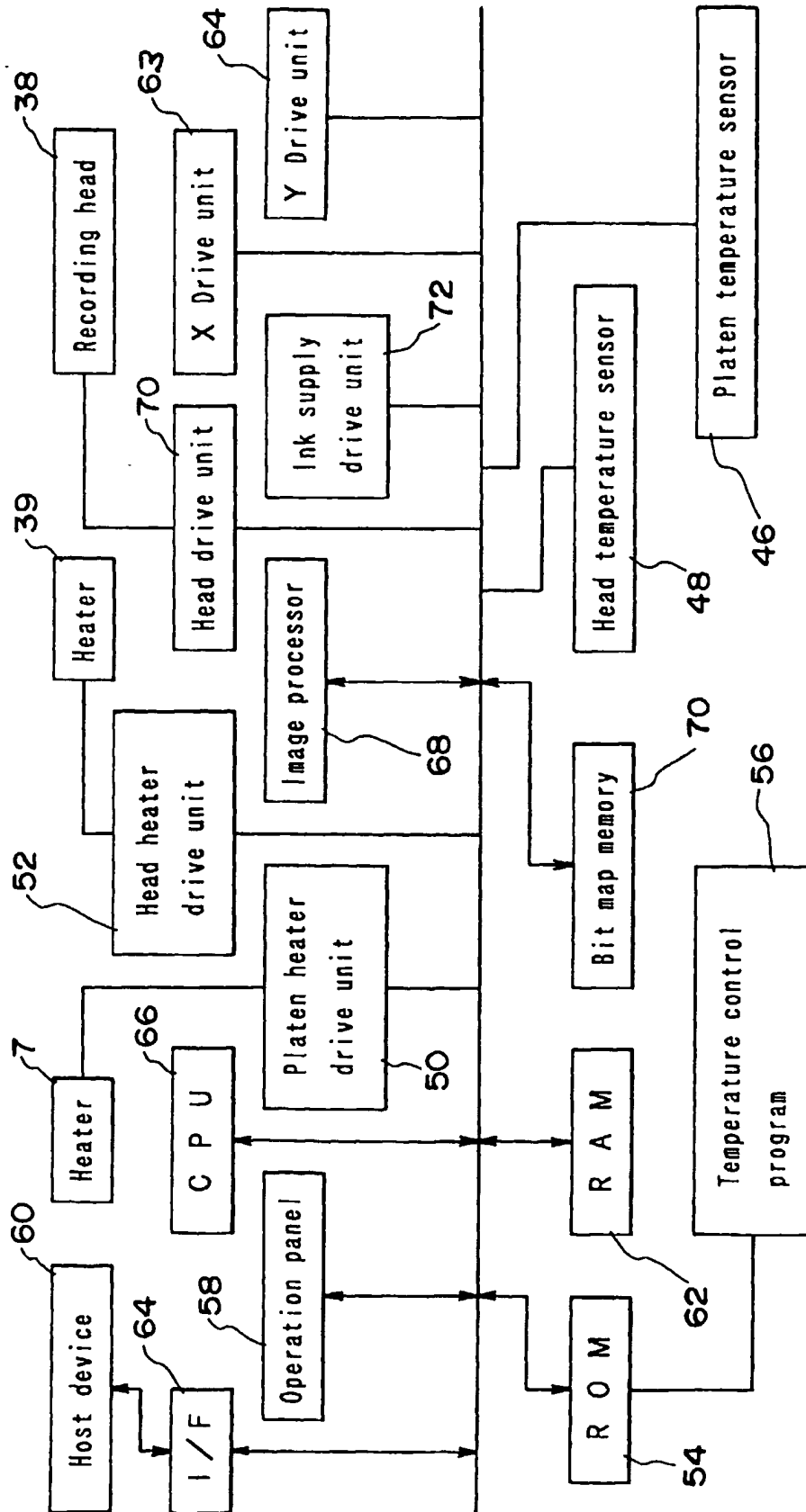


FIG. 2



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